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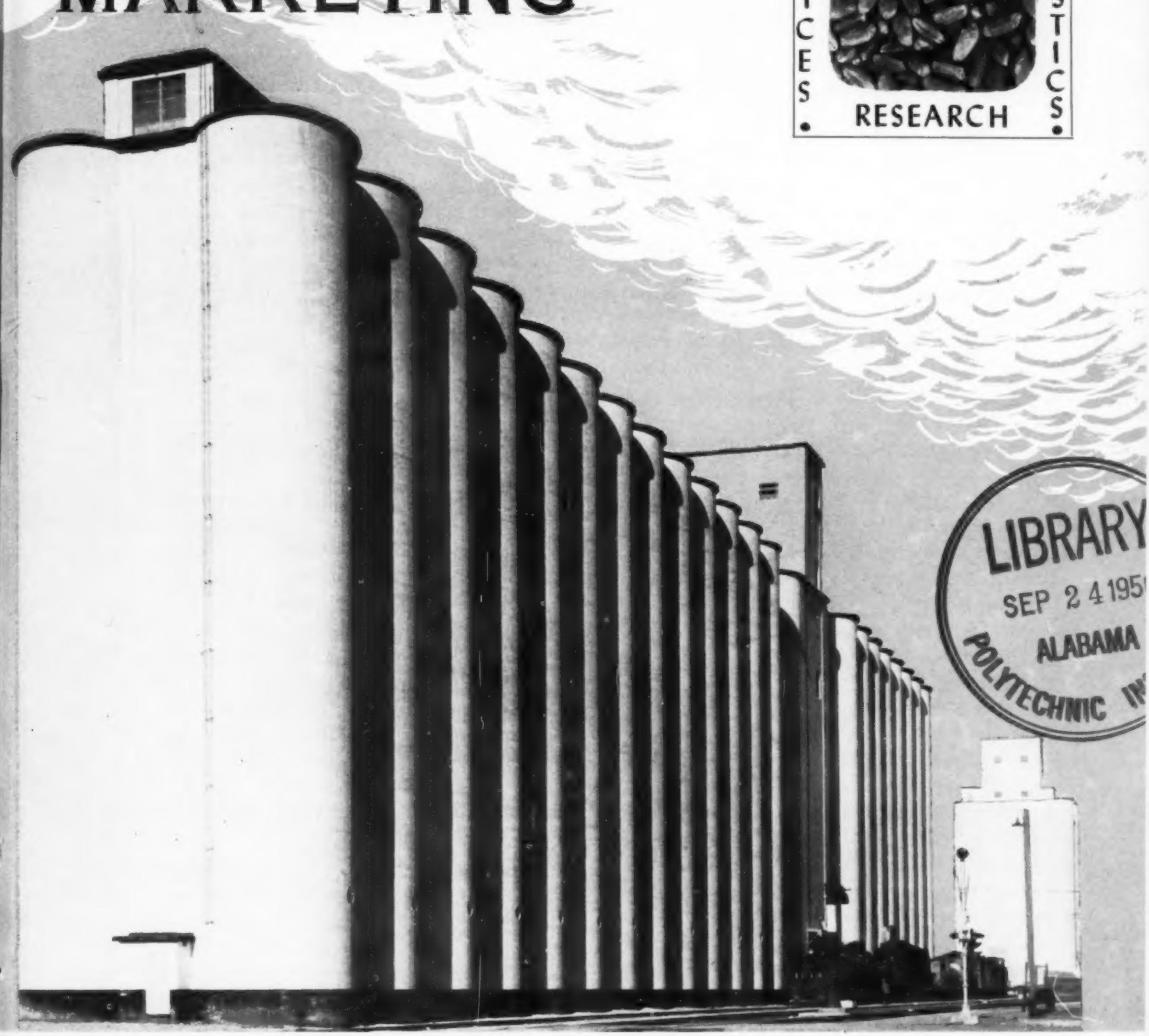

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U. S. DEPARTMENT OF AGRICULTURE • AGRICULTURAL MARKETING SERVICE

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Improved Marketing of

STORED EMPEROR GRAPES

By Dr. Harold T. Cook

The amount of decay that will develop in grapes during storage can now be predicted with considerable accuracy by the use of a forecasting method developed by Dr. John M. Harvey of the Marketing Research Division, Agricultural Marketing Service, Horticultural Field Station in Fresno, California.

Such a forecast is of great economic value. Knowledge of the potential decay makes it possible to market poor-keeping grapes before serious losses occur and hold for storage grapes with better keeping qualities.

A commercial cooperative association found the decay-forecast method to be very useful when put into practice during a recent shipping season. The association markets Emperor grapes from 18 vineyards in the San Joaquin Valley. They reported that the forecasting method had eliminated guesswork in the selection of the sounder fruit for later storage.

Emperors are the principal variety of grapes fed into the market during the winter and early spring. The keeping qualities of these grapes enable them to emerge fresh and crisp from months in cold storage. Even so, early stages of disease that may be undetectable when grapes are stored may cause an outwardly sound lot to deteriorate after a much shorter time in cold storage than normally would be expected.

Research workers placed a representative sample of berries from a given lot of grapes in a humid, sterile container at room temperature. They found that the number of moldy berries which developed after a few days would accurately indicate the relative keeping qualities of the corresponding lot in cold storage. Then there was no doubt as to which lot should be withdrawn from storage first and marketed.

Decay in stored grapes is caused primarily by infections that occur before harvest. Fumigation can kill the fungus spores on the surface of the grapes. But it will not affect fungi that have entered the berries. This infection actually develops in storage, after the fumigation process.

In tests at Fresno, researchers used representative samples of grapes selected from random plots in several vineyards. These they fumigated with sulfur dioxide gas to kill surface spots. Then they held the samples for 10 days in covered containers under sterile conditions at room temperature and high humidity.

The rest of the crop was packed under normal conditions, fumigated, and placed in cold storage. Within 10 days, the sample grapes showed signs of fungus growth which had not been killed by fumigation and had not been apparent at harvest. An almost identical amount of fungus growth developed in the corresponding grapes in cold storage—but after 3 months or more.

When the experiment was put into practice in the San Joaquin commercial storages, samples were taken by clipping individual berries from packed lugs of grapes as they passed along the conveyor toward the lidding machine. This method involved little extra work for the plant foreman. But it provided a good measure of the potential decay present in each specific lot of grapes going into storage.

Readings were made within 10 days, and records made of the forecasts. Shipments from the storage stock were then made by moving first the fruit from plots in which a high percentage of decay was indicated and holding for the late market only the grapes from plots in which low decay was forecast.

In an average season, the San Joaquin association would otherwise expect to have to recondition 10 carloads of Emperors at considerable expense and loss to the growers. Through the use of the new AMS tests, many dollars in losses from storage decay may be saved.

Although this forecasting method is still in the developmental stage, it should not be long before other commercial enterprises adopt this valuable aid.

SHIPPING CONTAINERS for Prepackaged Carrots

By Philip W. Hale and Donald R. Stokes

The right package at the right time means dollars saved for marketing agencies shipping agricultural commodities. By using a shipping container that fits into their immediate transportation and merchandising needs, shippers often can cut sharply their expenses and reduce marketing costs.

One good example of this is shipping containers for prepackaged carrots.

Research specialists of the Agricultural Marketing Service found in a preliminary study during the spring of 1956 that shippers of prepackaged carrots could save from $100 to $145 per carload by using cheaper containers under suitable conditions. These savings take into account only differences in cost of the containers and labor to pack them.

But additional savings in freight and refrigeration charges also appeared possible.

The marketing researchers studied costs for three different types of containers used in shipping prepackaged carrots from the Rio Grande Valley in southern Texas. The three containers were the wirebound crate, a multiwall paper bag, and a polyethylene bag.

The number of crates or bags of carrots shipped per carload varied. But a carload averaged about 500 containers holding 48 units of prepackaged carrots. Total container and direct packing labor costs, including assembly and closing, amounted to $216 per car for wirebound crates; $72 per car, for multiwall paper bags; and $113 per car, for polyethylene shipping bags.

The wirebound crate was most widely used in the area studied. Forty-eight 1-pound polyethylene consumer units of carrots were packed in each crate.

The multiwall bag consisted of 3 thicknesses of heavy-duty, wet-strength paper. The bag was 30 inches long, 15 inches wide, with a 6-inch gusset. It was closed with gummed tape, staples, or stitched. Each multiwall bag contained 48 one-pound polyethylene consumer units of carrots.

The polyethylene shipping bag was made from 3 mil polyethylene film. It was a flat bag 30 inches long, 15 inches wide, and closed with wire or gummed tape. Each polyethylene master shipping bag held 24 one-pound polyethylene consumer units of carrots.

No attempt was made by AMS researchers to develop or evaluate a polyethylene bag large enough to hold 48 consumer packages of carrots.

The average cost of wirebound crates was 41 cents; multiwall paper bags, 12 cents; and polyethylene bags, 9 cents each. Since the polyethylene bags held only 24 packages of carrots, the equivalent cost of 2 of these would be 18 cents.

AMS made time studies in 8 plants packaging carrots to determine the cost of labor (based on a $1 per hour wage rate) to assemble, pack, and close the 3 types of shipping containers. Six of these 8 plants studied used wirebound crates, 3 used multiwall paper bags, and 2 plants packaged in polyethylene shipping bags. Some plants packed in more than one type of container.

Using 2 polyethylene shipping bags for each wirebound crate or paper bag, the total comparative direct labor cost for assembling, packing, and closing the wirebound crates, paper bags, and polyethylene bags was 2.3 cents, 2.4 cents, and 4.7 cents, respectively.

Because of the extreme flexibility of the polyethylene shipping bags, it was difficult to place consumer units in them. Thus, the cost of packing carrots in 2 polyethylene shipping bags was nearly twice as great as packing each of the other two containers.

Most of the plants were using the multiwall and polyethylene bags on an experimental basis. Some plants packed them by hand, holding the bag open with one hand and packing it with the other.

One plant used metal chutes for packing carrots in the paper bags. They packed the consumer units in the chutes. Then they placed the paper bag over the chute. When the chute was tilted, it dumped the consumer units into the shipping bag. Although this

method appeared efficient, no Agricultural Marketing Service studies were made on its operation.

AMS made a number of experimental test shipments in which comparable carrots were packed in wirebound crates, multiwall paper bags, and polyethylene bags and shipped in the same car. Four carrot-packing plants participated in these shipments. Researchers evaluated these shipments when the cars arrived in Midwest and Northeastern market terminals.

Wholesalers generally preferred wirebound crates. They liked their sturdiness, stacking ability, familiarity to the trade, and general ability to be rehandled without breakage. For the most part, receivers who resold their produce to wholesalers, jobbers, or retailers were unenthusiastic about the multiwall paper and polyethylene bags. But they stated that the bags were a natural money saver for receivers who distributed produce through their own retail outlets.

The multiwall bags did not appear desirable for shipments which were top-iced. When wet, the bags split or came apart easily. However, one receiver reported satisfactory experience with a large number of full carlot multiwall bag shipments of carrots. These carrots were hydrocooled before packing and shipped with ice in the bunkers only.

The use of multiwall paper bags does not appear desirable for mixed-vegetable car shipments unless the bags can be protected from damage by wood crates and from top ice, if top ice is used.

Polyethylene master bags appeared quite durable and usually held up under top-icing.

There was some breakage of the polyethylene bags in some test shipments. One lot of these bags came apart at the bottom seal. Apparently this resulted from improper sealing.

A few polyethylene bags were punctured. These punctures usually were small, and the contents did not spill out. When the bags rubbed against a bulkhead separating the bags from the wooden containers in the car, the bags were severely damaged. This, of course, would not occur in full-carload shipments.

Many receivers said they like to handle the small 24-unit polyethylene bag and that some of their customers preferred the smaller shipping container.

With railway protective services currently in use for prepackaged carrots there would be some difference in total cost of ice needed to properly precool carrots shipped in bags and refrigerate them in transit as compared to the cost of the ice used for top-ice shipments in wirebound containers.

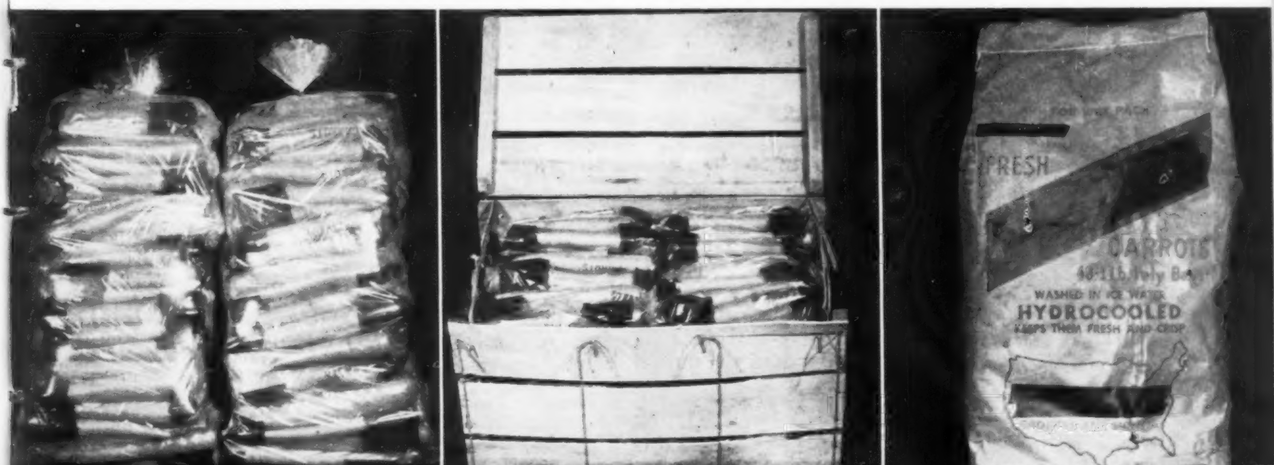
Presumably there would be some difference in freight costs due to the different tare weights of the 3 containers—and because 550 paper bags normally are loaded per car as compared with 510 crates.

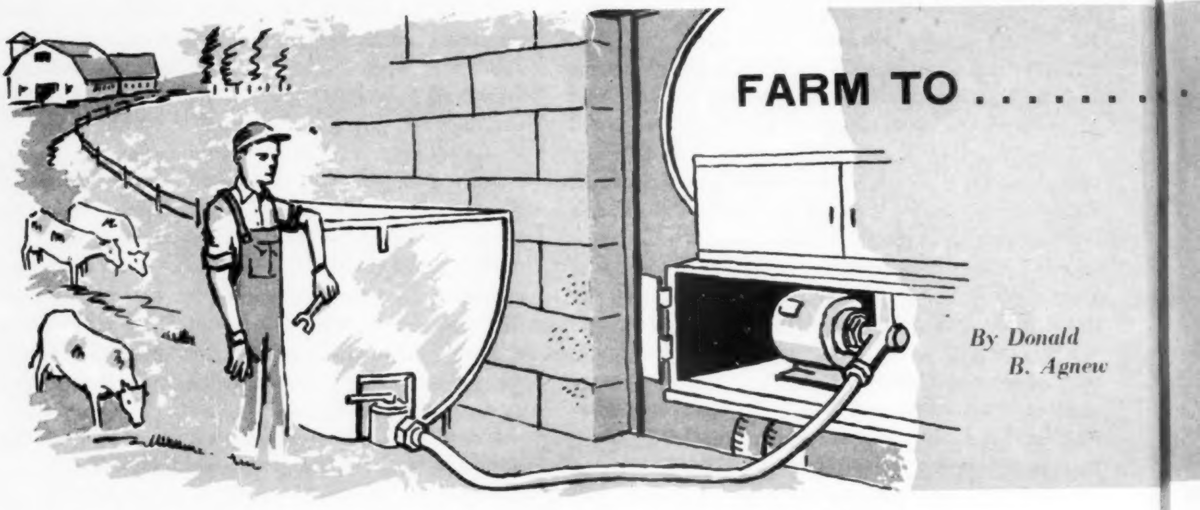
Preliminary studies did not determine other differences in costs, such as machinery and equipment in the packing shed and labor required to load and handle alternative containers at wholesale and retail markets.

About 17,000 carloads of carrots were shipped in the United States in 1955. Thus, the potential savings are high if shippers whose circumstances warrant a change in master containers shift to the paper or polyethylene shipping bags.

It is likely that each of the different types of containers studied in this report, as well as fiberboard cartons and wood crates, will be used to satisfy certain requirements for which each container is best suited. However, more research is needed to adequately determine under what conditions the various containers can be used to the best advantage.

POLYETHYLENE SHIPPING BAGS hold 24 one-pound consumer packages of carrots. Wirebound crate and multiwall paper bag contain 48 one-pound consumer-size packages each.





FARM TO . . . . . .

By Donald B. Agnew

ASSEMBLY of mechanically cooled milk in bulk, farm to plant, is one of the newer developments in milk marketing in most dairy regions. Bulk handling helps in holding down the cow-to-consumer marketing costs. It also helps in maintaining milk quality.

Milk, fresh from the cows, is cooled in bulk in a coldwall tank at the farm. Later, it is pumped into an insulated tank truck for its up-to-100-mile trip to market. On arrival at the plant, the milk is pumped off direct into storage vats or the processing line.

Fast disappearing at milk plants is the can-receiving operation with its lifting of heavy milk cans, its high labor requirement, and large investment in equipment.

The impact of the shift to bulk milk assembly is currently under study by the Marketing Research Division of AMS. The study is part of a broad field of research conducted to find ways to improve marketing services and reduce marketing costs.

The shift from cans to bulk tanks affects milk plants, milk haulers, and dairy farmers. Costs and investments are changed, as well as the jobs at each point, for cooling, handling, hauling, and receiving the milk.

Bulk handling is favored at most milk plants because of large savings in investments and labor. AMS researchers estimate that investment in milk-receiving equipment ranges about one-third to two-fifths lower for bulk rather than can systems. This amounts to $6,000 to $15,000, depending on size of plant.

With bulk, more flexibility in receiving schedules is possible, but more storage is needed. The cost of the extra storage would reduce somewhat the investment advantage of bulk receiving.

Receiving and cooling milk at plants also costs less for bulk than for can. Estimated savings range from 5 to about 25 cents per hundredweight for milk plants of typical size. Potential savings are least for very large or very small plants. And for some of the smallest existing plants, it may even cost slightly more to receive milk in bulk.

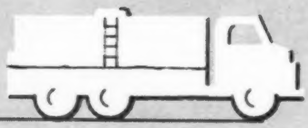
Most of the plant savings are in fixed cost and labor cost—and labor is worth $1.10 to $2.75 per hour. Labor for receiving milk is about 2 to 35 man-hours lower per day for bulk than for can operations, for plants of 100 to 1,600 hundredweight daily volume.

Smaller savings come from less use of refrigeration, utilities, and cleaning supplies. Total savings vary with plant size and with how efficiently labor was being used before the shift to bulk.

On the milk collection routes, rates charged to farmers for hauling are commonly lower for bulk than for can, by about 5 to 25 cents per hundredweight. But on some routes the hauling charge for bulk milk is higher than the former can rate.

The shift to bulk assembly offers haulers an opportunity to revise hauling rates to cover increased truck cost where these adjustments had been slow. It offers milk plants an opportunity to eliminate subsidies paid to haulers where the rates charged did not cover costs. But with bulk or can hauling some plants still pay the trucker or the farmer a part of the hauling cost.

The milk hauler's investment per truck is higher—up 50 percent to install a tank on his "can" truck or twice as much for a new tank truck with its heavier chassis. Truck operating costs are about the same (9



BULK MILK HANDLING COSTS

to 11 cents per mile) for 1,500- to 1,800-gallon tanks and 135 to 150 cans, most common capacities.

But the typical tank truck carries a larger load, at lower hauling cost per unit of load, than its can counterpart. Lower cost for hauling milk in bulk also includes some savings from revising the collection route, hauling more than one load daily, picking up larger loads of milk per farm, or picking up the milk every other day.

These methods result in a larger volume of milk per day and per mile of truck travel. Thus they result in lower truck cost per hundredweight of milk.

On farms, the cost of cooling and handling milk is higher for bulk than for can, except for large milk volumes. Labor cost is somewhat lower, electricity cost about the same, and fixed cost substantially higher for bulk compared with can handling on farms. On most farms the amount of labor saved per day amounts to about 1 man-hour or less.

An additional advantage is that chore work at milking time is easier. The lifting of cans is eliminated.

On some farms, the monthly bill for electricity may be higher after a bulk tank is installed. On some Northeast and Midwest dairy farms, bulk cooler operation may bring into effect a "demand" charge or a monthly service charge in the rate schedule. But even with higher electricity cost, cooling milk in bulk uses no more electricity than cooling milk to the same temperature in cans.

Fixed cost on the farm represents not only the investment in the tank unit (or the can cooler and cans). It also covers additional costs in switching a farm to bulk—for improvement of the milkhouse, wiring system, or farm lane. The amount varies greatly.

Fixed cost is higher on farms for bulk than can systems; higher per hundredweight for smaller tank capacities than for larger capacities; and higher, the lower the average use. Thus, farms with tanks tend to have larger daily milk production (and less pronounced seasonal variation in production) than those with cans. Also, small-volume producers tend to install the larger tank needed for skip-a-day milk collection, and to increase milk production once the tank is installed.

Other cost changes with bulk assembly result from changed jobs. With bulk handling, a part of the job and cost of receiving milk is shifted from the city milk plant to the farm, and from plant labor to the truck driver and farmer.

The truck driver measures, samples, and transfers the milk for each producer. He also records the volume picked up. The farmer cools the milk, washes and sanitizes the container, and disposes of the dairy waste from the container rinsings.

For the added responsibilities, the tank truck driver usually is paid more than the driver on a can truck. The farmer's earnings for the added functions he assumes with bulk handling are not so certain.

The farmer usually is able to offset a part of his increased cost with savings from reduced milk loss, and the smaller amount and less difficult chore work. He may also be able to negotiate price premiums, or lower hauling rates.

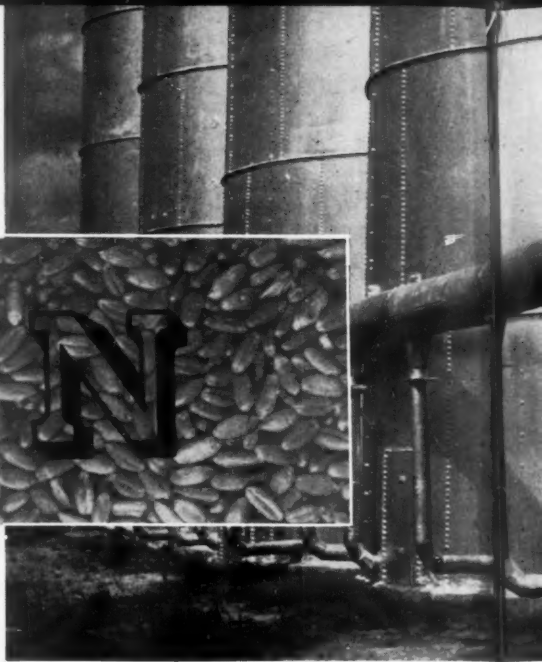
An important question is whether or not the sum of net savings, price premiums or reductions in hauling rate are adequate to amortize the farmer's large equipment investment and high operating cost. In some cases, the dealers voluntarily have paid farmers a premium for bulk-handling milk to encourage the installation of farm tanks and enable the plant to take full advantage of the benefits of bulk handling.

What are the prospects for bulk milk assembly in the future? By January 1956, there were about 30,000 milk tanks on farms, nearly double the number a year earlier. Over 600 milk plants in nearly every state now receive part or all of their milk in bulk.

The shift from can to bulk equipment among milk plants, milk routes and farms will likely continue, and the rate may even increase.

How far the shift to bulk milk handling, farm to plant, will go, and how soon, are matters of speculation. Its impact on milk marketing costs and practices will be affected in part by the rate and extent of the shift. Some of the necessary adjustments may be painful. But they may be smoothed by further research.

AERATION OF STORED GRAIN



By Leo E. Holman and George H. Foster

Aeration has helped one Texas elevator operator solve some of his storage problems. Like most operators do, he used to "turn" his grain—move it from bin to bin—to condition it. But, to do this he had to keep 1 of his 5 steel storage tanks empty.

He installed an aeration system with the help of an Agricultural Marketing Service engineer. Now, he doesn't have to turn his grain, and he's got room for another 26,000 bushels of sorghum. The system paid for itself in less than a year.

Aeration probably won't eliminate all turning, but it seems to have a place in the future. It can condition grain just as well as turning—and sometimes a lot better—and it costs less.

Once grain is stored, it may go out of condition for a number of reasons. Condition is affected by heat, molds, bacteria, insects, odors, and other factors.

To combat these problems, elevator operators have long practiced turning grain. Some attempts were made to use aeration for this purpose in the '30's. However, early failures led to skepticism within the trade.

Recently, increasing reserves of grain have directed research towards aeration. Much of the early work was done on Liberty ships used to store surplus grain. Research has uncovered many of the early mistakes and provided practical aeration systems.

In aeration outside air is moved through the grain by a fan. The fan is hooked up with a duct that evenly distributes the air through the grain. In some cases, connecting ducts enable one fan to aerate several storages (*see cut*). After a while, the temperature of the grain comes down to that of the outside air.

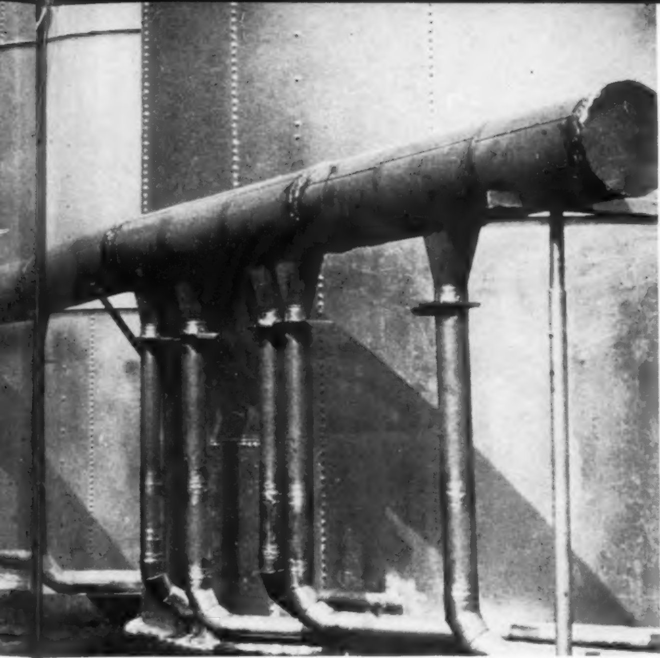
By cooling the grain, aeration does a number of things. It tends to minimize mold growth, fermentation, and insect activity. Most grain molds and bacteria grow slowly, or not at all, below 70° F. Insect reproduction stops at grain temperatures below 60° F., and many insects die from starvation when grain temperatures drop to 40° F.

Aeration also equalizes grain temperatures, thereby preventing moisture migration within the grain mass. This is most important in the northern areas where variations often cause troublesome migration and accumulation of moisture. In the southern areas aeration is more important for removing heat than controlling moisture migration.

In the rice producing areas, it is used to hold undried or partially dried rice in storage between drying. By doing this the undried rice can be held longer between passes through the drier, increasing drier capacity. Some operators claim they obtain considerable drying while aerating. Continuous aeration at least helps reduce rice temperatures and thus retards mold growth and other deterioration.

Marketing research engineers and entomologists have developed methods for using aeration systems to apply fumigants and clear them from the grain. The fumigant can be recirculated through the grain by providing a return duct system.

One grain elevator operator reports that fumigating



with his aeration system saves him more than $12,000 a year. In some cases aeration may reduce the number of fumigations that are needed.

Continued research is needed to tackle existing grain aeration problems. AMS is doing just this at 7 locations throughout the country: College Station, Texas; Lafayette, Indiana; Ames, Iowa; East Lansing, Michigan; Watseka, Illinois; Athens, Georgia, and Manhattan, Kansas.

Tests have been conducted in Indiana with wheat stored in bins 150 feet deep. The wheat was cooled to 50° F., after 500 hours of intermittent fan operation. Power costs amounted to less than $\frac{1}{10}$-cent per bushel.

In Iowa, it was found that corn can be cooled too much. Additional work is being done to obtain optimum low grain temperatures.

Research is being carried on in Michigan with dry edible pea beans. With the trend toward bulk storage of this crop there is added interest in aeration.

The application of aeration to sealed storages is being studied in Illinois. This method may supply satisfactory conditioning without the problem connected with using outside air.

In Georgia, aerated wheat stood from December to the following September without being turned. During the same period, nonaerated wheat had to be turned and fumigated 3 times. The costs of power for turning and for fumigant were 7 times the cost of aeration.

Tests have been made in Kansas with aeration being done in stages. It may be done this way or in one step. It costs less in fan operation to cool in one step. However, grain must remain at high temperatures until the late fall.

In the Kansas tests, cooling was started soon after the bins were filled. Grain temperatures averaged around 100° F. Fans were stopped when the grain reached outside temperatures of around 80° F.

Second cooling stage reduced grain temperature to 60°, and the third to 40° F. Each stage required from 200 to 300 hours of fan operation to cool the wheat to a uniform temperature.

Generally, aeration takes from 200 to 500 hours in a deep storage. It only takes 3 or 4 days in a flat storage of shallow depth.

The volume of air needed for successful aeration depends on several factors. These include geographical area, the kind of grain, the depth of grain, and desired rate of cooling.

Higher airflow rates are desirable in the South because grain temperatures are higher and there is less desirable cooling weather.

The resistance of wheat to airflow is greater than that of rough rice or grain sorghum, and several times greater than the resistance of shelled corn.

Grain is generally aerated with air-flow rates of $\frac{1}{10}$ cfm per bushel and lower. Recommendations call for at least 1 cfm per bushel for drying moist grain. Therefore, any drying accomplished during aeration will be minor.

Cooling time is about the same regardless of the initial grain temperatures. In Kansas, it took the same amount of time to bring the temperature to below 40° F., when the initial temperature was 60° F., as it did when it was 85° F.

A FAN used to aerate wheat in a storage 100 feet high.

APPLE HANDLING METHODS AND STORAGE SPACE

By Charles H. Meyer

Every packinghouse and storage plant operator knows that he makes his largest profit when he uses up every inch of storage space in his plant.

But what is not so widely known is that the handling methods used must be suitable to the physical plant—to make the best use of this space. Savings due to lower operating cost methods may not be savings at all if these operating methods reduce the total amount of produce stored—for apples as well as other agricultural commodities.

These findings were made in a study of the effects of apple-handling methods on storage space. The study was made under an Agricultural Marketing Service contract with the Washington State Apple Commission. It was aimed at reducing handling costs in apple-packing and storage plants.

What the research people learned points up the various factors that should be considered by a plant operator, especially of an older plant, who plans to make a change in handling equipment. The operator must bear in mind total gross plant revenue for a given season in relationship to revenue from the total number of boxes of apples stored, minus the costs of handling the apples into, within, and out of storage.

For example: Assume that a 100,000-box plant shifts to a lower unit cost method of handling and reduces its storage capacity to 90,000 boxes. Shifting to the lower unit cost method reduces handling costs from \$5 to \$2.50 per thousand boxes. The savings would amount to \$275 per season—$(100 \times \$5) - (90 \times \$2.50) = \$275$. However, if the loss of net revenue on 10,000 boxes for this plant amounted to 3 cents per box, or \$300, the plant would suffer a net loss of \$25 by shifting to the lower unit cost handling method.

There are many factors which affect the use of space in cold storage rooms of different sizes and designs. So, it is difficult to develop criteria on space gained or lost by shifting from one handling method to another.

However, by using rooms of given dimensions, estimates can be made of the potential storage capacities when different size unit loads associated with different methods and equipment are used.

The Agricultural Marketing Service study compared three storage rooms of different dimensions. Two of the rooms were of the conventional type found in many older packinghouses and designed for clamp-type 2-wheel handtrucks. The third was of modern design with a relatively high ceiling and a roof supported by trusses to allow efficient use of industrial lift trucks.

In the study, all three rooms were converted, figuratively, to use of methods other than those for which they were designed. Six handling methods involving the use of different types of equipment were considered: the clamp-type 2-wheel handtruck; 12-box, 24-box, and 36-box industrial clamp-lift trucks; and 36-box and 48-box industrial forklift trucks.

Conversions included computations of space lost to aisles, posts, and refrigerating equipment.

Clamp-type 2-wheel handtruck.

Conventional storage room, 50 by 80 by 13½ feet. This room is designed for use of clamp-type 2-wheel handtrucks. Forced air cooling system outlets run the full length of the room, extending down 18 inches from the ceiling. These outlets are located over an 80-foot center aisle.

To provide for air circulation, the researchers allowed for one foot of space along the 80-foot walls and an 18-inch ceiling clearance over the entire room.

The inability to fully utilize space between supporting posts and restricted stacking height limit the use of industrial lift trucks in this storage room. The clamp-type 2-wheel handtruck allows the greatest box capacity. With this equipment, an operator can store 6,400 boxes more than the least adaptable type, the 48-box industrial forklift truck.

Conventional storage room, 50 by 110 by 12½ feet. This room also is designed for use of clamp-type 2-wheel handtrucks. The room is equipped with a coil-type refrigeration system consisting of 3 banks of coils with the middle bank centered over a 110-foot aisle. One foot of air space is provided along all 4 walls.

The 12½-foot ceiling limits the stacking height to 12 boxes without pallets. The use of pallets reduces this height to 11 boxes. Under the coils, stacking height is further reduced.

Here, too, a shift from 2-wheel handtrucks to any other type of equipment results in a loss of storage capacity. Only 15,300 boxes of apples can be stored with a 48-box industrial forklift truck, with boxes stacked 10-high beneath 2 banks of coils and 11-high in the remainder of the room. This number of boxes is about 44 percent less than can be stored by using the 2-wheel handtruck method and manual high-piling.

Industrial forklift truck.

Industrial clamp-lift truck.

Modern storage room, 80 by 90 by 20 feet. This room has a forced air cooling system with the ducts located above the optimum stacking height of 18 boxes for an industrial lift truck. One foot of space is provided along all 4 walls for air circulation.

The stacking heights here depend on the potential capacity of the equipment and not on ceiling height. As previously pointed out, the room has a trussed roof without supporting posts.

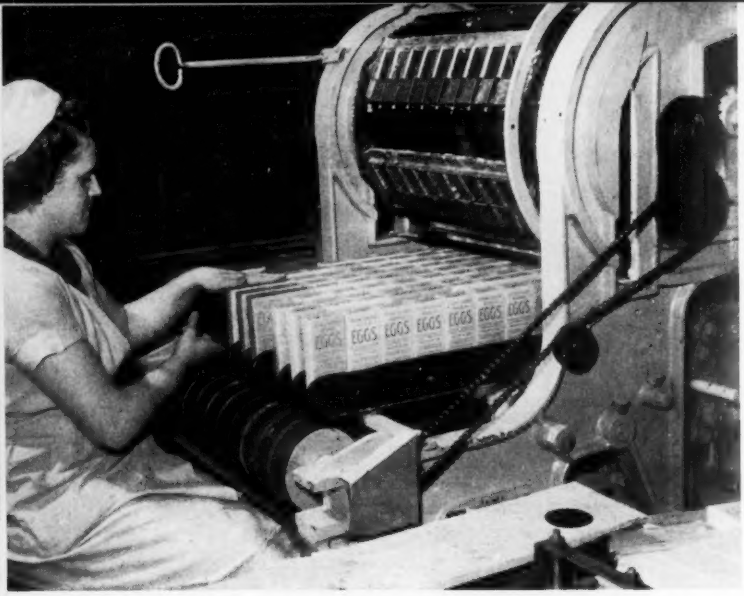
Designed to accommodate industrial lift trucks, this room is serviced best by this type of equipment. A maximum number of boxes (57,000) can be stored either by a 36-box industrial forklift truck, a 36-box clamp-lift truck, or a 24-box clamp-lift truck. Because a 48-box forklift truck requires a 144-inch aisle in which to maneuver, only 55,300 boxes can be put in storage by this equipment.

The 2-wheel handtruck or 12-box industrial clamp truck is able to store only 36,000 boxes in the room because one main aisle and 2 feeder aisles are needed. Stacking height is limited to 12 boxes.

In any individual plant, the equipment which allows the greatest storage capacity would appear to be the most desirable—as gross storage revenue is based on the number of boxes stored in the plant.

However, the choice of apple handling methods and equipment cannot be made solely on the basis of theoretical revenue considerations. There are other factors that enter into the plant operator's decision as to the choice of type of equipment.

These include speedier handling, less bruising of fruit, lower handling costs, and smaller capital investment in facilities. In many cases, some of these factors may be of greater importance than small losses or gains in gross storage revenue.



Machine-wrapping of packages of dried eggs protects the contents from moisture.

DRIED EGGS

By Mary T. Swickard

New methods of processing . . . merchandising emphasis on convenience . . . increased consumption of dried eggs.

Interest in domestic production and consumption of dried eggs (egg solids) is on a gradual upswing in this country with new methods of processing resulting in a more flavorful as well as convenient product.

Long accepted in baked goods from stores and bakeries, in frozen desserts, in canned mixed dishes and confections, dried eggs are now coming into the kitchen in the form of packages of mixes for cakes, muffins, cookies, and pie fillings.

Agricultural Marketing Service specialists estimate that over 23 million pounds of dried eggs were produced in 1955. Discounting the World War II period, the 1955 total represents a gradual increase since 1935 when 3 million pounds were produced.

Although purchases for the military and other government programs brought dried egg production to 105 million pounds in 1945 and 93 million pounds in 1950, little of this was being used by the civilian consumer.

However, 17 million pounds were produced in 1952, all for domestic use. Today this figure has been upped another 6 million.

Modern-day egg solids is a highly versatile product with a fine "fresh egg" flavor. It is a far cry from the product remembered by the World War II serviceman, who was exposed to long-stored, high-moisture egg solids, often unappetizing and unpalatable.

During the early part of the war period, the solids contained as much as 8-percent moisture, a definite deterrent to satisfactory long-term storage. Often a considerable time elapsed between packing and consumption, and off-flavor frequently developed.

As early as 1943 the stability, and to some extent the initial quality, of the solids was improved through more thorough drying and the exclusion of air in the packaging. Moisture content now ranges from $2\frac{1}{2}$ percent to 5 percent, depending on the manufacturer's specifications.

But egg solids take up moisture readily. To protect flavor during storage, dried egg products must be kept in tightly closed containers. The container should be moisture resistant, especially in humid climates. Often egg solids are packed in an atmosphere of carbon dioxide and nitrogen to prevent flavor changes. Dried whole eggs and yolks are held and shipped under refrigeration of 50° F. or below.

Several variations of the regular egg white, egg yolk, and whole egg are produced for special purposes. For instance, there is a fortified whole egg, which contains 25-percent extra yolk. There is also an egg white that has been milled before drying in such a way that it whips rapidly and has excellent whipped volume.

Sometimes the egg is pasteurized before drying, to produce solids suitable for use in uncooked or lightly heated products.

Many of the processors produce dried eggs under USDA's egg products inspection program. An AMS licensed inspector checks their entire processing operation for adequacy of facilities, sanitation of equipment and operating procedures, types of raw materials used, and the finished egg products.

Although both the pan and spray methods are used for drying egg whites, the spray system is the customary means for drying whole eggs and yolks.

The spray method involves spraying the well-mixed liquid egg under pressure (2,000 to 6,000 pounds per square inch) into a chamber through which hot dry air (180° to 380° F.) is moving. The air absorbs the moisture from the egg, and the dried particles fall to the floor of the chamber. The liquid egg is generally prewarmed (80° to 140° F.) to make the drying easier.

In using the pan-drying method, the liquid whites, after treatment to remove the natural sugar, are dried in shallow pans in heated cabinets. The dried product is either broken up in flakes or ground.

A process of treating egg whites with yeast or enzyme to thin the thick whites and to remove the natural sugar before drying has been developed in recent years to prevent browning during storage. With some slight modifications this desugaring process, first used only for egg whites, has now been extended to whole eggs and egg yolks, with considerable improvement in the products. The flavor is more like that of shell eggs, and the keeping quality is better than before desugaring was practiced.

Egg solids has all the properties for which eggs are valuable in mixed foods—leavening, emulsifying, thickening, binding, coating, and fortifying the nutritive value. It permits increased facility in use because it can be added to foods in the dry condition in as great or small proportions as desired. It also can be substituted for shell eggs in regular proportions.

Reconstituted with water, the solids can be used in all the ways shell eggs are used, except as whole fried, hard boiled, or poached eggs. In addition, the solids have the virtue of being of constant quality, having lengthened shelf life, and being everpresent in case of an emergency household need.

Only a few processors are now packing the solids in small packages for household use. These packages are generally distributed through high-class specialty stores in large cities. The net weight of the egg solids sold in these "consumer-size" packages ranges from 5 ounces to 3 pounds, or the rough equivalent of 10 to 100 two-ounce shell eggs.

At present the largest percentage of egg solids produced is used in the food manufacturing business—for baked products, noodles, confections and ice cream, and for the wide and growing variety of ready-prepared quick bread, biscuit, cake, frosting, and pudding mixes now made for the home. Very little egg solids are sold on the retail market as such. Of the total retail sales, the principal part is whole solids.

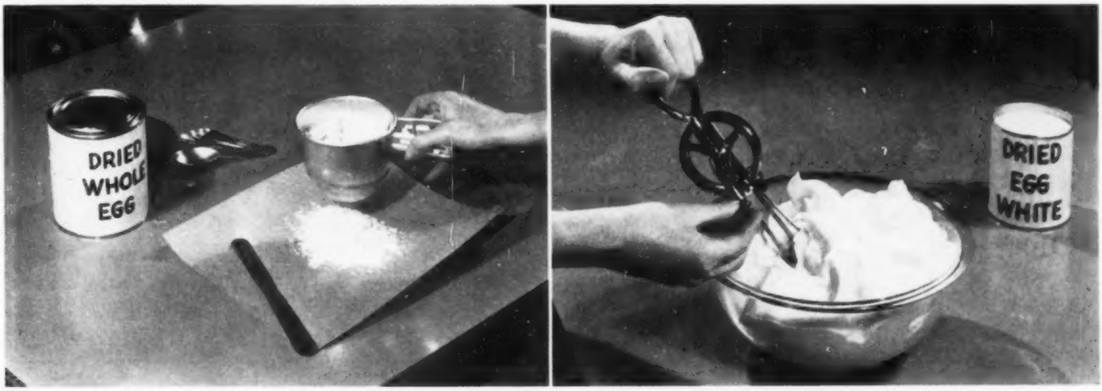
Marketing specialists point out that, with increased merchandising emphasis on convenience food items, it might well be an ideal time to extend egg solid consumption to the homemaker, the camper, and the traveler. Distribution in small packages would better acquaint these potential users with the more obvious advantages of the product.

Campers would be quick to realize that egg solids are much more easily packed than shell eggs, which often are not even available in certain areas.

Likewise, homemakers would be more aware of the value of being able to measure eggs more accurately in a dry form, to mix a part of an egg for some special task without waste, and to add dry eggs to homemade mixes and baked products.

Space in the refrigerator also is of importance, and the equivalent of many eggs may be stored in the space ordinarily required for a few shell eggs.

Also, there no longer would be the need to crack a single egg, to separate a single white from the yolk.



DRIED EGGS enable homemakers to measure eggs more accurately in a dry form and mix a part of an egg for some special task without waste.

SURPLUS POTATOES for livestock feed had to be cooked, chopped, or gouged.

BAGS OF STARCH made from potatoes are ready for shipment

POTATO DIVERSION PROGRAM

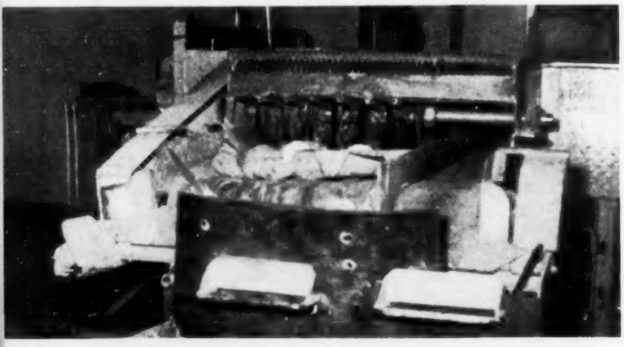
By Rex Hinshaw

How do you market a crop that has all the prospects of being much larger in size than you can sell? Add to this an earlier crop of the same commodity that's hanging on the market. You get a good picture of the dilemma before the potato industry with late crop potatoes for the 1955–56 marketing year.

But the result was one of the best marketing years for late potatoes, with reasonable prices to producers and consumers alike, and the delivery of generally excellent quality potatoes to consumers.

Here's the story:

In August 1955, the oncoming late potato crop was estimated at 45 to 50 million bushels larger than the amount considered desirable to meet requirements. The summer crop was in surplus, market was dull, prices low. The need for action was apparent.



SLICED POTATOES are ready to drop onto a belt that will carry them into cull chute. These potatoes were used as livestock feed.

Meeting in Chicago in August, representatives of the potato industry took immediate steps to tighten regulations in areas operating under marketing agreements and order programs. Potato men from nonmarketing agreement regions also resolved to follow the same plan—despite lack of means of enforcement.

All culls plus 20 percent of the remaining potatoes, particularly the lower grades and undesirable sizes, were to be withheld from the market. This would identify the surplus with lower grade potatoes. At the same time consumers would get a steady supply of the better grade potatoes.

To assist the potato industry, Agricultural Marketing Service late in August 1955 announced a program to stimulate diversion of lower grade potatoes into the manufacture of potato starch and for use as livestock feed. The program would supplement the price usually paid to growers for potatoes used for these purposes.

To obtain prompt improvement in market conditions and to extend expected benefits over a longer period, a sliding scale of payment rates was to begin late in September 1955. A higher rate of diversion payment was established for the early period, dropping on January 1, 1956, and again on April 1, 1956. This was included in the original announcement to provide an incentive for more immediate diversion.

Encouraged by this cooperation, the potato industry drew up marketing plans for Northern California, Oregon, Washington, Idaho, one county in Utah, Colorado, Maine and a 3-county area in Pennsylvania.

Approval of these plans allowed immediate participation in diversion activities for these areas which produce about 55 percent of the late-potato crop.

Most of the total quantity of diverted potatoes—85 percent—went into starch plants in Maine, Colorado, Idaho, and Washington. These operated under a contract between the manufacturer and AMS. The manufacturer agreed to pay growers and other vendors a price higher than the "going" price by the amount of the diversion payment. The manufacturer was then periodically reimbursed the difference.

This simple plan of diverting potatoes through starch plants gave impetus to the overall program. Bookkeeping was kept to a minimum. The grower or vendor did not have to submit a voucher in claiming payment. He simply received a higher price at the starch plant than he otherwise would have obtained.

Also, the diverted potatoes were immediately ground to pulp at the starch plant. There was no chance of them being sold back into trade channels.

But the problem facing the industry was so acute that it needed more than this diversion. Potatoes for livestock feed were also included to expand the diversion outlet into areas not served by starch plants.

Here again the prime requisite for a diversion payment was assurance that the potatoes would be removed from the commercial market. To qualify as being diverted under the program, potatoes for use as livestock feed had to be cut, chopped, sliced, cooked, or gouged to such an extent that 90 percent of them would not meet U. S. No. 2 quality requirements.

Almost 3 million bushels of potatoes were mutilated and used to feed livestock. There was not a single report of abuse of this program.

Diversion activities, however, were not carried on under the AMS program alone. Approximately the same amount of potatoes was used as livestock feed, for starch, and in other nonfood uses by growers and industry members outside the program and without the benefit of diversion payments. It was this extra cooperation throughout the potato industry that helped to turn 1955–56 into a good marketing year.

Although unfavorable weather had somewhat reduced the anticipated yield, some 34 million bushels of potatoes were diverted. Of the 17 million handled through the AMS program, about 12 million met the quality requirements of U. S. No. 2 grade, 2-inch minimum diameter—this qualified them for payment.

All this resulted in a better quality potato reaching the market, moderate prices for the consumers, and a graduated rise in returns for farmers.

BARRELS of lower grade potatoes line-up outside of starch plant.

POTATOES are moved into a bin and then taken to a washing machine where the dirt is removed.

WORKER IN A STARCH PLANT removes stones and other foreign matter from potatoes ready to be ground.

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OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300 (GPO)

Agricultural Marketing Act—10 Years Old

Removal of price controls was uppermost in the minds of those concerned with agricultural marketing at this time 10 years ago. Although congressional debate on the fate of OPA occupied most headlines of the day, legislators were mindful of post-World War I agricultural experience and were looking farther ahead. They sought to avoid or alleviate precipitous price declines as overseas demand for the products of a war-expanded agriculture subsided.

In this atmosphere the Research and Marketing Act of 1946 was quietly enacted as one of the longer range steps to cope with anticipated difficulties. Agricultural marketing research was featured among the activities authorized by the Act.

Title II of this legislation was designated as the Agricultural Marketing Act of 1946 with the stated objectives of providing a scientific approach to reducing costs, improving services, and achieving more orderly marketing to the end that the full production of American farms might find remunerative outlets.

Restrictions on food sales and limitations on market services were vanishing in 1947 when the first appropriation was provided for the new legislation. The transition from market shortages to abundance was well underway before the research got started.

Neither the problems nor the appropriations anticipated for the Act were forthcoming to the degree expected. Nevertheless, considerable research was started that contributed to marketing adjustments under the rising cost conditions of the postwar period. Impending surpluses of farm products as well as support for research were cut back as hostilities occurred on the Korean front.

By 1953, interest in marketing research revived as emergency needs for farm supplies receded. Retail prices were rising and the farmers' share of the consumers' dollar was falling. This occurred despite the fact that consumers were continuing to spend a higher percentage of their income for food.

A higher share of postwar expenditures was for away-from-home eating, for higher quality products, and for built-in-maid service.

Continued large farm output, greater competition for the consumers' dollar, and declining foreign markets have led to lower farm prices and surpluses. They also led to greater industry efforts to induce consumers to buy more farm products as well as to greater Federal support for agricultural marketing research.

Evidence of added market services is clearly apparent in the many new food, fiber, and industrial products that were unknown or unavailable a decade ago. Prepared cake mixes, boneless frozen meat cuts, etc., were designed to ease the housewives' burden. Expansion in popularity of cotton for women's dresses in spite of the appearance of new synthetics represents the net result of highly effective marketing methods accompanying improved products.

The whole series of plastic products using animal and vegetable fats for raw materials illustrates comparable developments among industrial outlets.

The phenomenal growth in size and number of supermarkets may be regarded as more easily recognized aspects of equally substantial changes that have been made in all marketing functions.

Several articles appearing in this issue illustrate the varied, less widely recognized advances that can now be reported regularly as marketing research approaches maturity.

Industry is in the course of adopting improvements based on research which is helping progress toward less expensive methods for reaching wider markets and greater sales of farm products. The pace toward these ends must be fast in view of still-rising costs and agriculture's demonstrated ability to produce for a growing economy.

—Dr. Harry C. Trelogan, Director
Marketing Research Division, AMS

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